DRAFT
ENVIRONMENTAL AUDIT REPORT

INDIAN TOBACCO COMPANY LTD
SARDAR PATEL MARG
SAHARANPUR

Presented by

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CHAPTER 1

Introduction

Environmental auditing, as a policy instrument for the abatement of industrial pollution, was introduced in India by the Government of India in 1992. This policy envisages an annual environmental performance report that will be submitted by industry to the Pollution Control Boards, and aims to determine the concerns and responses of industry with respect to environmental issues. It also aims to identify the information and technological gaps, incentives and programs that are important for the integration of environmental concerns into decision-making at all levels.

The Indian Tobacco Company (ITC) Limited, Saharanpur Cigarette factory was established in the year 1925. Tobacco for manufacturing cigarettes is received from Andhra Pradesh. It is further processed in the factory before cigarettes are manufactured. Various brands of cigarettes, Plain and Filter, Regular and King size, are manufactured in the factory. Some of the brands include Scissors, Wills Filter Navy Cut, Gold Flake Filter King etc. All these brands are largest selling cigarettes in their own group. The sophisticated brand Classic is also manufactured here.

The Tata Energy Research Institute (TERI), New Delhi, conducted the environmental audit for the Indian Tobacco Company Ltd.,(ITC), Saharanpur, as per the requirements of the report to be submitted to the U.P. State Pollution Control Board. In addition, a detailed environmental audit was carried out. The audit focused on air, water and noise pollution abatement, as well as odour and solid waste management. The resource management study focused on the environmental problems and the management of natural resources within the plant have been identified and mitigation measures have been recommended.

CHAPTER 2

Process description

Process description

The cigarette manufacturing plant has been divided in to three major divisions as follows,

(i) Leaf handling yard (LHY)
(ii) Primary manufacturing division (PMD)
(iii) Secondary manufacturing division (SMD)

Leaf handling yard (LHY)

Leaf handling yard consists of leaf as well as stem handling sections in separate. In leaf handling section the raw tobacco leaves (lamina), which comes in bales (100 Kg) and in cases (200Kg) are opened by the bale opening machine. This is weighed and is sent to the slicer machine, where they are sliced and are entered into the conveyor system. At this point the lamina is mixed with the scrap (tobacco leaf rejections collected from various process machines) in a particular ratio about 200 Kgs of scrap for each operation.

In the same way the tobacco stems are also opened and are weighed in the stem handling section. And they are fed by the stem auto feed system, where they are air lifted (air lifting is done by the pneumatic system) and are carried in to the primary manufacturing division.

Each operation takes one hour duration, in which about 5000 Kgs of lamina and 1000 Kgs of stems are used.

Primary manufacturing division (PMD)

The mixture of sliced lamina and the scrap enters in to the direct conditioning cylinder, where the lamina is treated with air and steam at proper ratio for loosening and flaring out the tobacco leaves. After conditioning the lamina moves in to the casing cum heating cylinder, where the lamina is subjected to chemical coatings (non injurious) to lose the moisture content. This material is filled by the conveyors in the lamina bins, where they are stored temporarily. From the bins they are conveyed through bin discharge lines in to the sieve. Here, various sizes of lamina are segregated and are air lifted (during the process of air lifting, the unwanted materials and heavier particles of lamina are removed). The air lifted laminas are entered in to the lamina air lock and tangential separator system, where the smaller fractions are separated out. The extracted larger fractions of lamina moves in to the lamina cutter, where they are finely cut and goes in to the dryer through conveyors. The smaller fractions of lamina that do not require cutting is mixed directly with the cut tobacco before it goes in to the dryer, where drying is done by the mixture of air and steam.

Simultaneously the air lifted stems from the stem auto feed system are passed in to the stem air lock and tangential separator and sieves, where the various sizes of stems are segregated and passes in to the stem conditioning cylinder through conveyors for conditioning the hard & brittle stems. The unwanted smaller fractions of stem, collected from the sieves goes for composting. From this the conditioned stems are filled in the Stem Bins by the conveyors for temporary storage and again they are conveyed through bin discharge lines in to the stem cutter, where the stems are cut in to smaller fractions and enters in to the cut rolled stem-conveying line. The CRS (cut rolled stem) is again treated with steam and air in the CRS-dryer. The dried CRS is air lifted and is filled in the CRS-bins. From the bins CRS is weighed and conveyed for mixing with the cut tobacco in the conveyor line, which is moving from the cut tobacco dryer machine.

This mixture of cut tobacco and CRS is fed in to the cooler machine for keeping the moisture content in the processed cut tobacco. In this system, moisture content is measured & maintained by the moisture analyzer. From the cooler, the cut tobacco is filled in the cut tobacco bins by the conveyors and again conveyed to the skip filling section (Skip Stacker), where the cut tobacco is filled in the skips of capacity about 12 Kgs. After the Skips are filled with the processed tobacco, are shifted to the cut tobacco storage (CTS) Yard.

Secondary manufacturing division (SMD)

The processed tobacco in the skips are transported and are filled in the hoppers of cigarette manufacturing machines. The cigarette rods are prepared and are cut in to appropriate length in which the filters are fixed, depends on the brand and quality. The finished product of cigarettes are shifted to the cigarette packing machines, in which exact quantity of cigarettes are packed in the printed cigarette shells with foil and slide (there are about 22 cigarette manufacturing machines and 14 packing machines, by which 12 brands of cigarettes are manufactured, totally about 40 million cigarettes per day). The packed cigarette shells are covered by the cellophane paper and are wrapped with the printed papers in the wrapping machines of about 10 to 20 cigarette packets. These packets are again packed in the CFC (corrugated fibre cases) and this final product is shipped in to the final product storage (shipping room).

The tobacco, which is recovered from the waste cigarette rods, rejected from the cigarette manufacturing machines are reused in the process. The trampled and rejected cigarettes from the cigarette manufacturing machines and the cigarette packing machines are sent back to the PMD, where it is slitted in the slitting machine. Hence, the tobacco recovered from the waste cigarettes are reprocessed and added back in the main process line.

The Main Process Flow Diagram has been given in Appendix I.

CHAPTER 3

Ambient air quality

Ambient air quality

Background

Ambient air quality assessment in every industry, is carried out on a monthly basis. The report of this being submitted to the State Pollution Control Board.The company has identified specific monitoring points within the plant premises to assess ambient air quality.

Due to the location of the factory, very near to the railway station, the importance of good ambient air quality cannot be over-stressed. A detailed survey of the plant was done as part of the Environmental Audit to identify specific monitoring points. The monitoring was done using high volume samplers to assess the suspended particulate matters, oxides of sulphur and oxides of nitrogen.

Ambient air quality standards

National ambient air quality standards (NAAQS) have been established by the Government, for certain critical pollutants (table). The major pollutants being particulate matter, oxides of nitrogen and sulphur. The monitoring is done with an averaging time period of eight hours.

Area	**Pollution concentration limit ($\mu g/m^3$)**			
	SPM	**NO_x**	**SO_2**	**CO**
Industrial/ Mixed use	500	120	120	5000
Residential	200	80	80	2000
Sensitive/ Protected	100	30	30	1000

Pollutant concentration limit = 8 hour average concentration in $\mu g/m^3$ not to be exceeded 95% of time in a year. Future ambient air quality standards would be more stringent. The Government proposed standards are given in Appendix II.

The analyzed ambient air quality results have been given in Appendix III.

Observations

1. All the parameters that were assessed (particulate, NOx and SO_2) were found to be within the statutory limits.
2. The ambient pollution is caused due to the factory's location. The factory is located very near to the railway station, which is a busy junction.

Recommendations

1. It is suggested that apart from present horticultural efforts being undertaken by the company, several tall and shady trees should be planted in and around the factory premises. It is a well established fact that trees are excellent absorbers of pollution; noise pollution emanating from the factory to the neighborhood will also be cut down.
2. Permanent ambient air monitoring stations should be adopted for regular monitoring in and around the factory premises according to the seasonal wind direction. Representative site are:
   (a) At the roof top of the T.T.C. Ex godown No- 5
   (b) At the roof top of the GJ godown No- 18
   (c) At the roof top of the shed for OCM- tobacco bagging
   (d) At the roof top of the tobacco cool store A-2

The other sites which can be considered in later are:

- a site near by the major trunk road
- at the residential areas of the east and west sides of the factory.

Stack emissions

Background

Main primary fuels used in most industries are oil and coal. The combustion of these, result in air pollution if not controlled adequately. The major emissions from the boiler and diesel generator are particulate, sulphur and nitrogen oxides and hydrocarbons. Carbon monoxide is also emitted in the case of improper combustion.

The Government has set guidelines and standards of stack heights and the concentrations of the pollutants. The installation of electrostatic precipitator's, bag filters and other air pollution control equipment have also been encouraged. The CPCB (Central Pollution Control Board) has developed industry-specific emission standards, and also general emission standards for specific pollutants (given below).

Emission standards

Pollutant	**Concentration (mg/Nm^3)**	**Emission**
SPM	150-1600 (mostly 150-250)	
SO_2		$H = 14Q^{0\,3}$ Stack height = 12 to 27, 200, 220, 275 m 4, 10 kg/T of conc. acid 0.25 kg/T of feed 2.5, 120 kg/t of sulphur in feed
NO_x	-	3 kg/T of weak acid
CO	1%	3 kg/T coke
H_2S	10	-
Lead	20	-
Mercury	0.2	-
Fluoride	5.25	0.3 to 6 kg/Mt of Al
Asbestos	0.2 of total dust, 2 of pure asbestos material	-
Acid Mist Emission	50	-

As part of the environmental audit, flue gas emission from the boilers and the DG sets were analyzed for particulate, SO_2, NO_x, HC, and CO.

Emission control/abatement measures undertaken by ITC

The company is well aware of its responsibility to meet the emission standards set by the Board. The measures they have taken are : appropriate stack heights for the DG sets and the boilers; frequent maintenance of the DG sets and the boilers.

Observations

1. All the emission parameters (SPM, NO_x, SO_2, HC and CO), were monitored and analyzed are within the specified standards (Appendix IV).
2. The dispersion of the pollutants due to the stacks provided is adequate. The port holes and other structural requirements for monitoring have been provided.

Recommendations

Air pollution from the stacks is negligible. It is suggested that periodic in-house monitoring should be carried out so that the preventive measures could be taken in time if levels exceed the stipulated standards.

Shop floor air quality

Background

The Factories Act 1948, as amended in 1987, places a responsibility on factory management [Section 7-A (2) (e) and 41-F] to ensure that workers should not be at risk of ill-health as a result of the work they perform. Regulations require regular monitoring of the working environment in a factory to ensure that the levels of air borne chemicals and pollutants are within prescribed limits.

Considering the above responsibility, as part of the environmental audit, shop floor dust levels were assessed by the means of monitoring to determine the effects on the workers.

Dust concentration in the process areas is relatively high and the presence of a large number of workers throughout the day (and night), makes this a pressing issue for the company. The source and concentrations of tobacco dust was assessed to evaluate its impact on the health of the workers. No exposure level study was undertaken. Mitigative measures both house-keeping and long term that the company can take up have been recommended.

Health hazards on workers due to tobacco dust

Health hazards in the manufacture of tobacco related products, are essentially due to: tobacco dust, the changes that take place in the dust when it is exposed to heat and moisture, and physical contact with chemical substances used in the industry. The respirable fraction of dust ranges between 0.3 to 3.6 mg/m^3.

Several symptoms of health effects due to tobacco dust have been identified so far. Some of them are:

- Conjunctivitis
- Dryness and irritation of the rhinopharyngeal mucosa
- Fullness of the stomach

The above symptoms disappear after a few days' adaptation. ***Dermatoses*** of the hands and fragility of the nails have been noted in several cases amongst the bale/ case openers at the leaf and stem handling sections.

Major health effects of exposure to tobacco dust are:

- Respiratory disorders, in particular ***dyspnoea***, ***emphysema*** and ***chronic bronchitis***.

- At a mean length of exposure to tobacco dust of 15 years, low prevalence of chronic respiratory symptoms are indicated.
- Acute decreases in ventilatory capacity during the work shift could occur.

Dust abatement measures undertaken by ITC

The company has shown sensitivity to employees' health problems. To tackle the dust problem, centralized dust recovery filters have been installed for each process section. Dust generated from various sources within the process are channelized into the centralized DRFs'.

The company has installed six pneumatic systems, which transports the processed tobacco from one machine to another in the PMD. Since this is an enclosed system, the dust generated is minimum as compared to the conveyor systems. The company is in the process of installing some more pneumatic feeder systems - this would bring down the dust levels considerably.

In the PMD several process sections have been provided with hoods to allow for the outlet of dust. Adequate dust recovery filters/ cyclones and ventilators have been provided in the PMD [as well as in the SMD]. Exhausts have also been provided in both the sections.

In areas where tobacco is handled manually, the workers have been provided with handkerchiefs and masks to protect themselves from the dust.

Observations

Personal samplers were used to monitor the dust levels within the shop floor. Several samples were taken at various points that were identified (through a detailed survey) as sources of dust. The major criteria upon which the locations for monitoring were selected, is the presence of workers at these points for lengths of time.

Results reflect that the dust concentrations in the shop floors are high and are a cause of discomfort to the employees. The monitoring results indicating the dust concentrations are given in Appendix V.

Leaf handling yard - major observations:

Dust levels in the LHY are as a result of the tobacco lamina and stem bale/case opening, that is generated by manual as well as machine handling at these sections, at the points where the lamina and stem bale / case is opened and weighed for feeding in to the PMD. Dust concentrations in the LHY were found to be high. The monitored value shows that the workers here are exposed to dust levels over 5 mg/m^3.

Primary manufacturing division - major observations:

1. Large quantities of dust is generated at several points, where the tobacco (lamina & stem) are processed and transferred through belt conveyors and vibrating conveyors in between the process machines, are lamina slicer to D.C.C, casing cylinder to lamina bins, lamina air lock and tangential separator to dryer through lamina cutter, cut tobacco bins to skip stacker, stem air lock and tangential separator to S.C.C through sieves, stem bins to CRS dryer through stem cutter, and waste cigarettes slitting machine conveyors, etc.
2. The major contributor to the dust levels within the PMD is the cutting machines, Sieves, and vibrating conveyors. The very action of cutting and the dryness of the tobacco cause dust to be generated. The dust level recorded here was 4.5 mg/m^3.
3. After tobacco passes through the final stages of processing (i.e. drying and cooling), it is conveyed to the cut tobacco bins and again conveyed to skip filling section by conveyor belts. Here the tobacco is in its driest form and highest dust concentrations have been recorded here - 2.3 mg/m^3.
4. During the cigarette manufacturing and packing process, large quantities of cigarettes are discarded due to strict quality control. Many also fall to the ground during the process, and are swept away as wastes. This is taken to the Slitting Machine (Cigarette Waste Recovery Section), situated in the PMD, in which the tobacco is recovered. Very high dust concentrations have been observed here (3 mg/m^3).
5. Waste tobacco from the various processes in the PMD are collected in open boxes and transferred to the dump site. When the dry tobacco wastes drop into the boxes, dust is thrown onto the shop floor.

Secondary manufacturing division - major observation:

In the SMD monitoring was done at several points of cigarette manufacturing and cigarette packing machines. The machines themselves do not emit any dust and is mainly due to - manual loading of tobacco into the machines, floor sweepings and the regular blow cleaning of the machines and the employees. Some of the dust concentrations recorded at the machines are :

- Cigarette Making Machine (#11) = 2.2 mg/m^3
- Cigarette Packing Machine (#37) = 1.5 mg/m^3

Recommendations

Most solutions to dust pollution within the shop floor, are by means of simple house-keeping measures that could be taken up at little or no cost.

House-keeping measures

1. In the PMD the following measures should be adopted to bring down the dust levels:
    - Tobacco wastes should be collected in **covered** containers, so that the dust is not thrown into the shop floor environment. Simple polythene bag-like covers could be used.
    - Floor-sweepings should not be done manually, but by vacuum cleaners. This would contain the dust instead of allowing for its dispersal into the room.

2. Dust generated in the SMD section could also be mitigated to a large extent, by the above two methods. In addition, the following measure should be adopted:
    - The normal practice of the blowing dust off the machines and the bodies of the employees must be stopped and a vacuum **suction** system should be used.

Major recommendations

Most of the following recommendations would require detailed scoping and planning before implementation.

Leaf Handling Yard

In the LHY, provision should be made for an exhaust fan near the lamina and stem bale/case opening points. Automation of bale handling should be considered.

Cost of exhaust fan (24 inches/900 r.p.m) = Rs.3600/-

Primary Manufacturing Division (PMD)

1. The conveyor systems (belt and vibrating), transfers the tobacco leaves and stems from one process machine to the next should be covered. This could be done by providing a stationary metal cover over the belts, covering it from the top as well as the sides, without actually touching the moving belt. This would reduce some of the dust.

    Cost of the metal sheet to cover the conveyor belts is:
    Aluminum Sheets (3mm, 8x4, 26kg per ft) = Rs 630/kg- per meter (approx).
    This includes 5% of material cost for installation/ fabrication, etc.
    Total cost of conveyor cover could be worked out per running meter of the conveyor belts in the PMD.

2. The doors of the DRF room should be enclosed by dust proof materials. This will serve to contain the dust, noise and odour to a large extent. Constant maintenance of the DRFs and the cyclones should be done to avoid any leakage of dust.
3. In the Cut Tobacco Bin room (adjacent to PMD), large quantity of fine tobacco dust is generated when the processed tobacco is stored or retrieved. Constant maintenance of those bins and conveyors should be done to avoid leakage of dust from this room.
4. More exhausts and ventilators must be provided to ensure circulation of air.
5. In the skip stacker section a large quantity of tobacco dust is generated when the processed tobacco is put into the skips. The workers here are constantly inhaling large quantities of dust, causing tremendous discomfort to the workers. Presently, the hood provided is not effective in withdrawing the dust from the room.
   It is recommended that the outlet of the hood also be connected to the centralized DRF systems of the PMD. Proper filter masks may also be provided to the workers. Some more exhausts should be installed in this section.

   Cost of piping for hood of stacker to DRF
   Aluminum sheet (8 x 4 ft; 3mm; at the rate of Rs.85/kg) will cost
   = Rs.650/- per meter (approx). This includes 5% of material cost for installation/fabrication/etc.

6. It is recommended that the waste line slitting machine (or cigarette waste recovery section) be isolated from the PMD section. This section generates the highest concentrations of dust (recorded), and since this is in the same division where many employees are present, it should be relocated and enclosed.

Secondary Manufacturing Division (SMD)

1. Here, dust levels are high due to the cleaning of machines, operators/ personnel and the shop floor.
   * It is recommended that vacuum suction system should be used to remove the dust from the machines and the shop floor. Simple industrial vacuum cleaners could be used for this purpose.
     Cost of industrial vacuum cleaners = Rs. 12,300/- (item cost)

As part of the Environmental Audit, Effluent water samples were collected from the following points:

- Drinking water sample
- Inlet of Effluent treatment plan
- Outlet of Effluent treatment plant

Water pollution abatement measures undertaken by ITC

The company has constructed reservoirs for the storage of water. Tube wells (3nos) have also been dug to ascertain continuous water supply. The water is demineralized for process use at the water treatment plant.

Waste water from all parts of the factory is being sent to the ETP (effluent treatment plant), located at one end of the factory. The ETP has a been designed to receive not more than 60 - 70 KL/d of combined effluent. The detailed waste water management study has been given in the **Chapter** - 8.

Observations

The company has very effectively ensured water management. The main observations are:

1. Water consumption/requirement in the plant as a whole is relatively low.
2. The effluent treatment facility is taking care of the combined effluent loads.
3. The recycling of treated water for horticulture purposes is functioning efficiently.

CHAPTER 5

Noise pollution study

Background

Although noise is not one of the pollution parameters required to be considered in the environmental audit/FORM V (Gazette Notification), it has been studied here due to its importance as a potential health hazard.

In ITC, the noise levels are high and are causing discomfort to the employees/ workers. This has alerted the company to the problem of safety and occupational health of the workers. A safety, health and environmental cell has been set up, which monitors noise, dust and other health related aspects.

Health Effects of Noise

In 1976, the Government included "noise-induced hearing loss" as a notifiable disease. The Environmental (Protection) Act, 1986, under Section 6, has mentioned "Rules to regulate environmental pollution". This section has explained the maximum allowable limits of noise and concentrations of other environmental pollutants, for different areas.

Noise has only recently been recognized as a pollutant. Ample medical evidence reflects that human health is being affected by exposures to high noise levels.

The most common and best understood physiological effect of noise is hearing impairment - either temporary or permanent. The amount of permanent hearing loss produced by sufficient exposure to high-level noise depends on the nature of the noise, the time distribution of particular exposures, the total duration of the exposure over a lifetime, and individual susceptibility.

The main effects (each having their specific conditions) of noise on humans are:

- contraction of smaller arteries;
- hypertension or ulcers; and,
- repeated interference with sleep, leading to inefficiency.

Noise Pollution Standards

The measurements designed to determine noise levels, include intensity and frequency of noise periods of exposure and duration of noise. Unlike standards set for air and water pollutants, no specific noise standards have been set. Although ambient noise standards have been prescribed [by WHO and in the Environmental (Protection) Act, 1986], they do not take into account mixed environmental conditions that normally exist. Ambient noise standards have been set for day and night, and for industrial, commercial, residential and silence zones (hospital areas).

Ambient Noise Standards

AREA	dB(A) [DAY: 6AM-9AM]	dB(A) [NIGHT: 9PM-6AM]
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence zone	50	40

Background noise levels in quiet surroundings, with no specific source of noise, range from 30 - 40 dB(A). Heavy road traffic at a distance of 3 m gives between 85 - 100 dB(A); a boiler-house compressor room can give between 80 - 95 dB(A).

Permissible Noise Exposure for Industrial Workers

Occupational health studies indicate that the human exposure to noise at different intensities and for lengths of time, have adverse impacts on the recipient. The levels of noise [in dB(A)] that is permissible for an industrial worker per hour, in a day is given below.

EXPOSURE TIME (hr/day)	LIMIT IN dB(A)
8	90
4	93
2	96
1	99
1/16	111
1/32	114

Noise pollution audit

High noise sources and areas within the process shop floor (and outer areas within the plant premises) were identified. The noise sources identified for sampling are listed below. Noise levels were monitored at the sources using a noise meter dB(A) and at different distances from the sources.

The high noise sources identified are:

1. DG Sets room (power house)
2. Boiler room

3. LHY : - Lamina & Stem bale/case opening section
4. PMD : - Machines and Conveyor zones
    - DRF room
    - Cut Tobacco Bin room
5. Vacuum Pump & Compressor room
6. SMD : - Manufacturing & Packing machine zones
    - DRF room
7. Air Washing Unit room
8. Shipping room

Noise monitoring was done to determine the noise levels at various sources and at certain distances from the sources. The monitoring was done using a dB(A) meter. No monitoring was done to determine the exposure levels of the employees.

Noise abatement measures undertaken by ITC

The factory being located in an residential area, has to contain the noise levels to the minimum possible. Some noise abatement measures undertaken by the factory are:

1. The high noise levels [ranging between 100-102 dB(A)] emanating from the DG sets (especially the 1200 & 1000 KVA), required serious attention. The four DG sets are all in one shed but spaced out, and therefore it was found impractical to enclose the entire room; operational problems would also arise. Only periodic readings need to be taken by the operators, therefore an **acoustic room** - with noise levels ranging between 63 to 65 dB(A) - has been provided for them. They have also been given ear plugs for use outside the acoustic room.
2. The operators at the PMD machines, are exposed to high noise levels 88-95 dB(A) for longer periods of time. The number of operators at a machine at any given time, ranges between two and three. Each operator is entitled to an half hour rest, after every one hour. The company has provided them with **ear plugs** for protection.
3. Periodic safety and health awareness programs are being conducted by the company.

Observations

Although several preventive measures have been taken up by the company, the noise levels in some areas have been found to be high. The following are the main points observed during the study:

1. The noise level in and around the DG set room is high [101.5 to 78 dB(A)]. The presence of employees at the engineering section and overhauling section (which is just outside the DG room), for longer periods of time could have serious effects on their health.
2. The boiler house operators are exposed to 80-90 dB(A) noise levels throughout their shift. Since the operator's desk is less than five meters away from the boiler, they are faced with both high noise levels, as well as high temperatures.
3. The Air Washing Units (AWU) have their air suction facing the outside of the Secondary Manufacturing Division. This also is the common entrance to various sections administrative and process) of the factory. Noise levels between 90-98 dB(A) have been recorded near these AWUs'. Although no employee is present at all times here, the AWUs' are adding to the background noise levels within the factory premises.
4. The Vacuum Pump Room which is adjacent to the AWUs' is also a high noise source/area. Since the door of this room has been observed to be kept open at all times noise levels of 93-95 dB(A) have been recorded at the point outside this area. The noise levels at the pump (at-source) is higher [100-102 dB(A)].
5. The DRF (Dust Recovery Filters/Cyclones), are the other high noise sources/areas. Noise levels between 75-94 dB(A) at-source and at points from the source where the employees rest. The DRFs' and cyclones of the SMD section are enclosed in rooms and therefore the noise is relatively contained.
6. Noise levels at the cigarette making and packaging machines in the SMD section, have been monitored to be around 88-95 dB(A). The employees here are exposed to this level of noise for long periods.

Recommendations

All the recommendations given herein. are based on the observations during the detailed survey of the plant and the monitoring results. Most of the recommendations are mitigation measures, rather than reduction at the source. Since noise is as a result of vibrations, any item (especially metallic in nature) would vibrate and also resonate, making the sound louder.

DG set room

The 1200 KVA or 1000 KVA DG set is functional throughout the day in combination with one of the others [i.e. 5000 KVA, 250 KVA], depending on the requirements. The following is recommended:

1. The several openings to the DG set room have been provided with roll-down shutters which are always kept open. The noise thus emanates to other areas within the Power House. It is recommended that double vacuum doors are provided at these points. To provide for air circulation either air conditioners or air coolers should be provided.
2. The overhauling & fitting section that is adjacent to the DG set and Boiler room, is open and the presence of workers there constantly makes it an important from the health point of view. It is suggested that the entire overhauling section could be enclosed in an insulated room. Noise levels inside this room could be around 65 dB(A), as against 92-93 dB(A).

   Cost for insulation:

   - Outer material and masonry cost(concrete) = Rs. 150/- per sq ft
   - Insulating material (resin bonded) = Rs. 103/- per sq m

3. The power house employees who are present at the office for long periods are subjected continuously to high noise levels. The door of the office area opening towards the DG set room, is constantly being used. The opening and closing of this door allows noise to be transferred into the office area. Vacuum double doors could be provided here as well.

   Apart from the above, there should be provision of air conditioners in the office areas. This would reduce the noise transferred into the rooms from the windows, air vents and air exhausts.

Boiler House

The employees operating the boilers are uncomfortable because of exposure to high noise levels and temperatures in the boiler house. Since the operators are required to be present round the clock, it is crucial that they be protected from the noise and temperatures. It is suggested that an acoustic room similar to the one in the DG room, be constructed. The room can be constructed with a viewing window facing the boilers.

Air Washing Units (AWU)

As all the AWU's are functioning simultaneously, noise levels in this area is high. It is suggested that the screens of the AWUs (where the air is sucked in) be coated with rock wool. This will reduce some of the noise of the fans. Installation of silencers for the AWUs should be seriously considered.

Cost of rock wool insulating material

(50mm, 48 kg/cm^3 density) = Rs. 82/- per m^2

Vacuum Pump Room

The vacuum pump room is a high noise source. Operation of several pumps simultaneously is a cause for the high noise levels.

1. It is suggested that the vacuum pump room main door be kept closed - allowing only some ventilation to avoid any temperature rise.
2. The pumps should be appropriately encased by insulating material (resin bonded material). This will bring down the noise levels considerably. This will also reduce the noise emanating into the SMD section through the passage presently provided.
3. The entire room should be lined with the insulating material, such as the resin bonded material (suggested in the DG set area).

Dust Recovery Filters/Cyclones (DRF)

The DRF of the PMD & SMD is well insulated, therefore is able to contain the noise within the room.

1. It is suggested that the containment of the DRFs' for both the PMD and the SMD, be done by simple sound insulation material.
2. Engineering aspects should be assessed for improvements in DRF efficiencies. The feasibility of providing an in-built silencer in the cyclone motors must be studied.

Cigarette Manufacturing & Cigarette Packing Machines

The cigarette making and packaging machines are presently functioning with noise levels of 88-95 dB(A).

1. Any major noise level reduction would be through modifications in present machine design. The company has already installed and commissioned new Italian machines which have larger cigarette making facilities and are also less noisy. Technological improvements in the present machines should be assessed.
2. As the employees have already been provided ear plugs, it is suggested that the management ensures their proper usage. This should be done through training/educational programs, as well as personal interactions with the employees to ensure their agreement and participation with the systems adopted.

CHAPTER 6

Odour study

Background

The manufacture of cigarettes as the final product, is preceded by the processing of tobacco, which includes slicing, conditioning, sieving, cutting, blending and drying of tobacco (lamina and stems). Throughout this process, wherever the tobacco is in its dry state, dust levels are high. Odour emanating at each of these sources is also strong. The concern of odour in ITC, is not so much for that existing within the shop floor, as that which is dispersed to the neighboring residential areas

There are no norms for determining the odour levels/concentrations. The method used in this study was by means of human sensitivity to odour. In this study possible sources of odour, high odour areas and the mitigative measures that could be applied have been identified.

High Odour Areas

Areas identified, having high odour levels are:

1. Between the power house and the boiler house.
2. Near the leaf handling section & stem handling section at LHY.
3. Inside the process areas of PMD.
4. Near the lamina cutter machines of PMD
5. At the DRF- room passage of the PMD.
6. At the skip stacker section of PMD.
7. At the waste line slitting machine section of PMD.
8. Near the cut tobacco bin room
9. Between the SMD- DRF and the shop floor of SMD.

Observations

ITC has actively attempted to reduce odour levels. It is important for the Company to reduce odour that is being dispersed to the neighboring residential areas. De-odourizers, several ventilators and exhausts have been installed to reduce odour levels, but the problem still prevails. Odour is a difficult but an important problem that needs to be addressed, especially

The main observations are:

1. Humidifiers are provided in all the process rooms to maintain specific internal conditions. Shop floor dust particles are attracted to the moisture from the humidifiers. In such a case, when the dust-moisture particles are exposed to higher atmospheric temperatures, the moisture evaporates along with the volatile of the tobacco dust. This results in odour.
2. In areas where there is an air vent or an exhaust. the detectable odour levels are high.
3. Tobacco odour is strong in and around all the (PMD, SMD and the LHY). DRFs'.
4. At the shop floor of the SMD/PMD, high odour levels have been observed.
5. The entrance to the boiler house from the power house end is malodorous due to the exhaust of the process waste water.

Recommendations

The major recommendations for the abatement of odour pollution, evolve out of the fact that since tobacco is the main raw material and the odour observed is that of tobacco, it is possible to control it only to a small extent at the source.

The following are recommended for the abatement of odour:

House-keeping measures

1. Presently, it has been observed that the DRFs' of the PMD & SMD need to be maintained. There are some leakages from the system within the room. The conveyor system of the DRFs' could be enclosed in pipes to prevent the dust from being kicked up into the environment.
2. At every point where tobacco lamina / stems wastes (sizing/stem segregation/etc.) are generated in the PMD sections, they are (presently) collected in crates/boxes which are open to the environment of the shop floor. It would be useful to contain these boxes by allowing the wastes to fall into the boxes through a "chute" while keeping the whole box covered by means of the polytene bag. This will reduce the dust levels within the shop floor as well as the odour to some extent.
3. In the SMD section as well as the PMD section the shop floor is constantly being swept to remove sand and tobacco. The dust levels are further increased in the SMD when the dust from the machines and the operators are blown off by pressurized air. This could be reduced by using centralized vacuum suction systems.

Other major recommendations

1. The Environmental Engineering Concepts, Inc., USA, has developed a system patented as "EnviroMist" that has successfully been used in dust suppression, odour neutralization and outdoor cooling.

   The EnviroMist odour control system creates a super-fine water fog that may be combined with a wide range of odour-neutralizing materials for both interior and exterior applications. It is particularly effective with all-natural neutralizing products. It is lightweight compact, portable, with a flexible hose that permits quick setup in even hard-to-access areas. It has an anti-drip swivel nozzle and high-pressure, triple-filtration delivery system that creates a 10-micron fog droplet.

   The system is:-

   * completely automated operation programmable up to 24 hours.
   * operates at 800 psi (no compressor required).
   * delivers neutralizers at any required rate.
   * can inject a surfactant to better attract, hold dust.

   It has been successfully applied for:-

   * aeration ponds
   * air scrubbers
   * chemical plants
   * composting/landfill & garbage dumps
   * liquid waste ponds
   * industrial exhausts
   * solid waste management
   * waste water management
   * others

   It is essential that the system be tried on a pilot scale for tobacco odour before its application.

   Address of the company : Environmental Engineering Concepts, Inc.
   1220 South Gene Autry Trail
   Palm Springs
   California 92264 USA
   Telephone : 619 . 322-1111
   Fax : 619 . 322-4341

2. Environmental odour management limited, Australia, has also developed an odour control solution patented as PIIAN. It is an all-natural product which can be diluted and applied using the simplest of application apparatus. All the ingredients within PIIAN are GRAS, listed by the U S Environmental Protection Agency (EPA).

The typical applications of PIIAN are:

- in emission stacks and air scrubbers, as primary de-odourizer or as a secondary polishing agent to finish the exhaust emissions.
- in indoor air quality.
- in aeration ponds, lagoons and sludge pits. Here more advanced directionally controlled systems can be used; both systems are effective in de-odourizing fumes generated from this area.

The system could be applied using any of the following systems:

- Ultrasound Odour Controller
- Humidifan
- Micro cool
- Nozzle
- Atomizer

Equipment for Dispensing PHAN

Description	Type of Application	Area of Coverage	Consumption	Approx. Cost
Single Head Ultrasonic Humidifier (Baby Ultrasound) 230 V; 50 cycles single phase; 50 amps.	Indoors such as a cubicle where Ethyl Mercaptan odour exists.	1200 sq.ft	160-200 cc per hour	22870/- plus S.T.
Humidifan 1 HP motor; 35 ft; propulsion distance available with flame proof motor and oscillator.	Indoor such as a packing department. Could also be used outdoors.	5000 sq ft	400 cc per hour	31000/- without motor & oscillator
Micro Cool Nozzle With pump	Outdoors like at the ETP.	Pumps available to handle nozzles ranging from 40-1000.	4.1 lit/hr/ nozzle	US$ 6500 for pump with 120 nozzles.

Address of the Company : Environmental odour management Ltd.
78-80 Bellingara Road, Miranda
New South Wales 2228
Australia
Telephone : 61 2 544 7800
Fax : 61 2 544 7761

The above systems of odour controls could be adopted in the DRFs' of all the sections.

3. All the DRFs' should be enclosed in insulated (as suggested for the control of noise) rooms. This will contain the dust and therefore the odour generated to some extent.

4. The vents of the DRFs' open out to the outside environment allowing malodorous air to escape into the atmosphere. It is suggested that those vents that face parallel to the ground and those that face straight upwards be provided with a hood [Fig: 1(A), 1(B) & 2(A), 2(B)]. The hood could then be provided with the EnviroMist system to arrest the odour. This could be done at low costs. The effectiveness of this system of odour control must be tested on a pilot scale before application.
5. Tall trees should be planted along the inner boundary of the factory. The company should also consider taking up planting trees in the residential areas neighboring the factory.

CHAPTER 7

Solid waste management

Background

Processing of raw materials always generates large quantity of wastes. This is due to the fact that total material conversion is never possible. Although this is true, the minimization of the wastes to the extent possible, makes both environmental and economic sense. This is especially true in the case where the main raw material is being wasted. Waste minimization should be attempted at the source itself rather than at the end - as is important with the management of other forms of pollution (air/water).

In ITC, the main solid wastes generated are tobacco, paper and packaging material. The tobacco wastes that are generated are essentially undesirable for the final product. The paper and packaging wastes are generated from the secondary manufacturing division (SMD). It is in the best interest of the company to minimize the paper and packaging wastes.

The solid waste study conducted as part of the environmental audit, looked at the possibility of reuse, recycle and effective disposal methods. The material balance of the raw materials have been studied.

Solid waste management measures undertaken by ITC

The company has taken a lot of initiative in managing its wastes. The tobacco wastes that are generated in the PMD have inherent sale value. All the wastes -tobacco, paper and other wastes (CFCs', cardboard, bobbins, etc.) - are easily disposed off through contractors.

The solid waste (sludge) that is generated in the ETP (effluent treatment plant), is presently being used as manure for horticulture purposes within the plant premises.

Observations

1. The solid wastes that are generated from the leaf handling section (LHY), is mainly tobacco leaves that drop from the bales. The plastic packaging on the inside of the bales & cases is ripped open and is sent back to the supplier. Presently, the gunny bags and the cases are being sent back to the supplier for recycling.
2. Wastes generated from the PMD is mainly tobacco and sand. The tobacco wastes are generated at various stages in the process :

- Wet scrap from the cleaning of the DCC and SCC and casing cylinder (150-350 Kg/day).
- "Rat-tails" from the stem line (150-700 Kg/day).
- Sand (300-1000 Kg/day).
- Floor sweepings (50-350 Kg/day).
- Waste line slitting machine sand (200-500 Kg/day).
- DRF- Dust (50-300 Kg/day).

3. From the secondary manufacturing division (SMD), the main wastes, are generated are :
    - Waste cigarettes from the cigarette manufacturing & packing machines-tobacco is being recovered and reused in the process by the waste recovery system that segregates the paper from the tobacco.
    - Shells & slides, filter rods, foils and wrapping Papers.
    - Tobacco and sand from floor sweepings and machine cleaning
    - Small quantities of adhesives that are used to paste the cigarette paper around the tobacco.

4. Solid wastes from other sections of the factory, are mainly administrative wastes - mainly paper.
5. Negligible quantities of metal scrap wastes are generated from various sections (especially the workshops and the engineering sections).
6. Some of the solid wastes like Sand, collected from Sieves are being contracted away. There are several contractors who take away the wastes. Some of the tobacco wastes is apparently being composted outside. The bobbins for the cigarette paper, foils, and CFC, etc. are being sent back to the manufacturers for reuse.
7. The sludge that is generated from the ETP facility is dried in sludge drying beds and are further used for manure.
8. All the non reusable organic wastes (sand, rat tails, wet scrap, etc) are being composted.
9. All the non reusable solid (paper, filter, foils, etc) are being incinerated under the permission of central excise department.

Recommendations

Although most of the wastes are being reused within the plant (process) itself, some of the waste finds reuse potential elsewhere. The present waste disposal system adopted by ITC, ensures that the solid wastes are being removed from the factory premises effectively.

1. A more careful handling of the tobacco bales in the LHS. would reduce the tobacco (leaves and stems) from falling on the floor.
2. In the PMD. the cleaning of the DCC, SCC and casing cylinder from which the wet scrap is removed could be dry-cleaned to remove the tobacco wastes before the cylinder is washed. This would eliminate the disposal problems of wet scrap that is presently being experienced because it does not have re-sale value or be reused.
3. Large quantities (almost 10%) of "rat-tails" and other tobacco wastes are being generated in the PMD. Presently these wastes are being contracted away and used further for either manufacture of snuff or low quality cigarettes/hooka. Some of it is also being sent for composting. It is recommended that a biomass (tobacco) gasifier be used.
4. It is recommended that the remaining solid waste that is being generated, such as paper and other scrap, continue to be contracted away Since the quantity of this waste generated is not large, it makes economic sense to contract it out for disposal/reuse.
5. It is recommended that the existing bio-gas pilot plant has to be resigned for using the tobacco wastes as well as effluent treatment sludge. It will make economic sense to dispose out/ reuse.

CHAPTER 8

Waste water management

Background

The liquid wastes coming out of any industry are required to be treated before discharging them in to the environment. The quality of the treated wastes, recognized as treated effluent, must be of such quality that their discharges do not alter the quality and use of the receiving environment. Water pollution control programs are designed essentially to maintain/ restore the natural water bodies to various designated best use. The assessment, development and application of processes for treatment of industrial effluent depend on a detailed knowledge of the composition of the waste and its treated effluent.

ITC, Saharanpur, have facilities for water abstraction, storage, distribution, etc., for domestic, canteen as well as for industrial process and utilities use. The waste water generated are at present discharged out side the factory premises, with only the industrial waste amounting to 50- 60 Klit/ day being treated in the existing effluent treatment system.

The waste water management study conducted as part of the environmental audit, looked at the possibility of reuse, recycle and effective disposal methods. It is the objective of this study to advise ITC on characterization of the waste water with respect to quality & quantity, and to recommend a suitable treatment scheme to meet and exceed the quality standards prescribed by the State Pollution Control Board; so that the treated water may, at a later to be put to beneficial use purposes such as gardening, toilets, cooling water etc.

Waste Water Management measures under taken by ITC.

The treatment plant as existing of wastes from the PMD and SMD, paste room, and boiler blow down. The plant consists of a bar screen arrangement, followed by an aerated lagoon provided with 3 Nos. 5 HP aerators. In the aerated lagoon waste water is reacted with urea (2.0 kg/day) and DAP (0.5 kg/day). After aeration, alum addition is done in an agitated tank(bio - clarifier) at the rate of nearly 50 Kg alum per day. After alum addition, the waste stream is settled in a settling basin, with clear over flow received in a downstream holding tank, Hence it is pumped out to the final treated water channel over a V-notch weir. The treated water is being reused for horticulture purposes and the excess amount of treated water is disposed at the sewer running besides the factory.

Observations

For a number of reasons, the present system of treatment is not satisfactory and it is desirable to place the same with a proven, efficient and less cumbersome treatment system.

It has been found that the ETP is not working satisfactorily due to the following reasons.

1. The present effluent consists both organic and inorganic synthetic starch (a combination of natural and synthetic compounds.
2. There is no primary clarifier to settle down the larger wastes before treating the waste water in the aeration tank.
3. Reaction tank is small in size and aeration is not sufficient due to settling of sludge occurs in the reaction tank.
4. The bio-clarifier is smaller in size and provision of underflow sludge cleaning has not been provided. Hence periodical cleaning of bio-clarifier is needed, which disturbed the bacterial growth.
5. Storm water drains has not been kept separate from the industrial drains, which also disturb the stabilization of the plant.

Recommendations

Major recommendations to maintain low levels of water pollution and improve water balance are:

1. The high levels of H_2S at the ETP, reflect that the effluent is not being digested sufficiently. Although, background levels of H_2S would always be present as a result of any aerobic digestion, this could be reduced by more efficient aeration. It is recommended that monthly maintenance of the ETP (especially the aerators) is done. This is essential, since the factory is located in a residential area.
2. The process of recirculated treated effluent water for horticulture purposes should be continued.
3. The untreated waste water over flows from the ETP during the rainy seasons because of low level embankments. It is recommended that the side walls of the effluent treatment plant should be extended to some more height.
4. It is also recommended to modify the ETP for efficient treatment of waste water to meet the standards, set by the state pollution control board. The modified form ETP has been given in Appendix XII.

Appendix I

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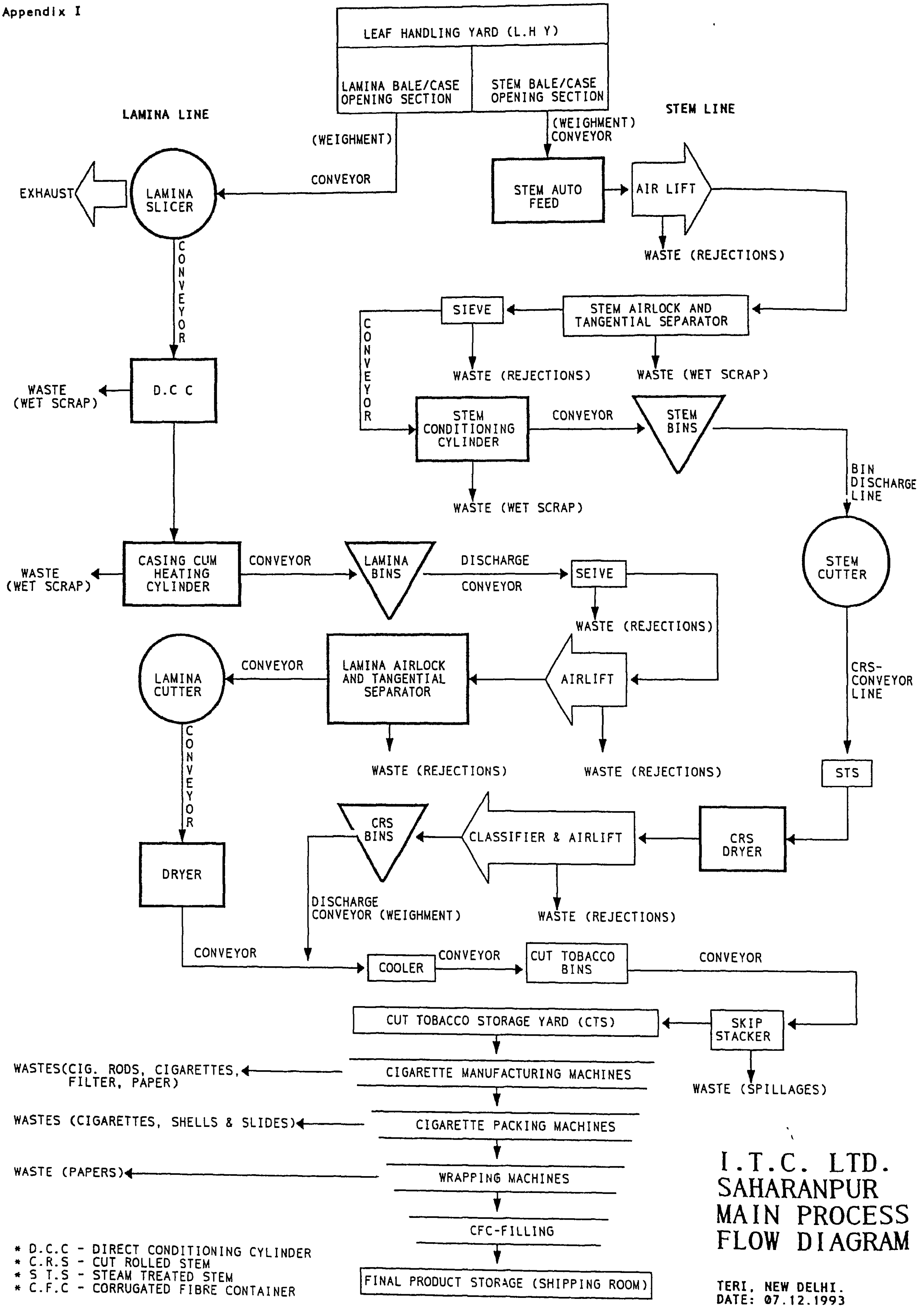
Process flow diagram

Appendix I



I.T.C. LTD.
SAHARANPUR
MAIN PROCESS FLOW DIAGRAM

TERI, NEW DELHI.
DATE: 07.12.1993

* D.C.C - DIRECT CONDITIONING CYLINDER
* C.R.S - CUT ROLLED STEM
* S T.S - STEAM TREATED STEM
* C.F.C - CORRUGATED FIBRE CONTAINER

Appendix II

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Proposed national ambient air quality standards

Pollutant	Averaging time	Concentration ($\mu g/m^3$)		Method of measurement
		General area	Sensitive area	
SO_2	Annual Avg* 24 hours 1 hour	80 (0 30 ppm) 130 (0.053 ppm) 655 (0.25 ppm)	30 30 -	-Improved West Gaeke -Ultraviolet fluorescence
NO_2	Annual Avg* 24 hours 1 hour	100 (0.053 ppm) 200 (0.106 ppm) 470 (0.25 ppm)	30 30 -	-Na- Arsenite method -Gas phase Chemiluminescence
SPM	Annual Avg* 24 hours	200 (400 $\mu g/m^3$)# 400 (800 $\mu g/m^3$)#	100 (200 $\mu g/m^3$)# 200 (400 $\mu g/m^3$)#	-High volume sampling -Average flow rate not less than 1.1 m^3/mt

* Annual Arithmetic mean of minimum 1^4 measurements in a year taken twice a week 24 hourly at uniform interval.

Not more than 2% of the total number of observations in a year should exceed the figures presented within the brackets for SPM.

Appendix III

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Ambient air quality

Sampling location : Near the Primary manufacturing division (up wind)
Station Code : A
Date & Time of sampling : 03-12-93 (12.30 pm)
Ambient temperature : 24.5 °C
Sampling duration : 8 hours
SPM concentration : 180.8µg/Nm3
SO2 concentration : 25.57 µg/Nm3
NOx concentration : 8.03µg/ Nm3
Remarks : All results are within limits.

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Ambient air quality

Sampling location	:	Guest House (down wind)
Station Code	:	B
Date & Time of sampling	:	03-12-93 (12.30 Pm)
Ambient temperature	:	24.5 °C
Sampling duration	:	8 hours
SPM concentration	:	185.84 μg/Nm3
SO2 concentration	:	8.86 μg/Nm3
NOx concentration	:	149.5 μg/Nm3
Remarks	:	The particulate matter and oxides of nitrogen are in the prescribed limits. But sulphur dioxide is above the limits. this is due to the railway station (coal engines).

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Ambient air quality

Sampling location : On the store yard (down wind)
Station Code : C
Date & Time of sampling : 04-12-93 (6.0 Am)
Ambient temperature : 23 °C
Sampling duration : 8 hours
SPM concentration : 172.15μg /Nm3
SO2 concentration : 5.25μg/Nm3
NOx concentration : 56.75μg/Nm3
Remarks : All results are in limits.

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Ambient air quality

Sampling location	:	On B.E. office (down wind)
Station Code	:	D
Date & Time of sampling	:	04-12-93 (10 pm)
Ambient temperature	:	15 °C
Sampling duration	:	8 hours
SPM concentration	:	217.34 μg/Nm3
SO2 concentration	:	0.85μg/Nm3
NOx concentration	:	113.58μg/Nm3
Remarks	:	The concentration of oxides of nitrogen is more. The level of particulate and oxides sulphur dioxides are in limits.

Appendix IV

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Stack monitoring data

Date & Sampling time : 03-12-93 (2.0 pm)
Stack attached to : Oil fired boiler
Stack shape and material : Mild steel
Stack diameter(m)
(i) Top : 1.2
(ii) Bottom : 1.3
Stack height
Above the roof : 35.6
Above the GL : 55.6
Type of draft : Forced
Type of fuel : Furnace oil
Fuel Consumption : 200 (l/m)
Atmospheric pressure : 985(milli bars)
Flue gas temperature : 2635 °C
Ambient temperature : 27 °C
Velocity of the flue gas : 2.86 (mts/second)
Flue gas flow rate (Nm^3/hr)

Particulate matter : **1138mg/Nm3**
Oxides of Sulphur(ppm) : 69
Oxides of Nitrogen(ppm) : 22
Carbon monoxide(ppm) : 65
Carbon dioxide(ppm) : 9%

Remarks : Specific fuel consumption for the day = 0.295 kWh. Units generated during 1430-1530 = 240. AC, 1=300 A, P=210 kW. DC, 1=25 A, V = 50 V. Oil Pressure was 3.5 kg/cm^2.

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Stack monitoring data

Date & Sampling time : 04-12-93
Stack attached to : D.G.Sets
Stack shape and material : Mild Steel
Stack diameter(m)
(i) Top : 2.14
(ii) Bottom : 2.16
Stack height
Above the roof : 45.6
Above the GL : 55.6
Type of draft :
Type of fuel : HSD
Fuel Consumption :
Atmospheric pressure : 990(milli bars)
Flue gas temperature : 145 °C
Ambient temperature : 27 °C
Velocity of the flue gas : 2.7
Flue gas flow rate (Nm^3/hr)

Particulate matter : 249 mg/Nm3
Oxides of Sulphur(ppm) : 17.6
Oxides of Nitrogen(ppm) : 4.18
Carbon Monoxide : 00.04%
Carbon dioxide : 04.0%

Remarks : Specific fuel consumption for the day = 0.295 kWh. Units generated during 1430-1530 = .240. AC, 1=300 A. P=210 kW. DC, 1=25 A, V = 50 V. Oil Pressure was 3.5 kg/cm^2.

Appendix V

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Shop floor Air Quality

Sample Number : 1
Site : Leaf handling Yard (Lamina Section)
Sampling Time : 4 hours
Air flow rate (lpm) : 2.0
Ambient temperature : 19
Starting time : 9.45 am
Finish time : 13.45 pm
Weight of the dust (grams) : 0.0007
Dust concentration : 1.5 mg/m3
Remarks : In this particular area the there are about 30 people are working constantly Normally there are the bale opening machines. This leaf handling yard works for only for two shifts. This area is having fairly high amount of dust.

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Shop floor Air Quality

Sample number : 2
Site : Leaf handling Yard (Stem section)
Sampling Time : 4 hours
Air flow rate (lpm) : 2.0
Ambient temperature (°C) : 19
Starting time : 9.45 am
Finish time : 13.45 pm
Weight of the dust (grams) : 0.0006
Dust concentration : 1.3 mg/m3
Remarks : In this particular area the there are about 30 people are working constantly. Normally there are the bale opening machines. This leaf handling yard works for only for two shifts. This area is having fairly high amount of dust.

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Shop floor Air Quality

Sample number	:	3
Site	:	Primary Manufacturing Division (Lamina Cutter Section)
Sampling Time	:	4 hours
Air flow rate (lpm)	:	2.0
Ambient temperature (°C)	:	24
Starting time	:	2.30 pm
Finish time	:	6.30 pm
Weight of the dust (grams)	:	0.0021
Dust concentration	:	4.4 mg/m3
Remarks	:	In this area raw tobacco is processed for the cigarette manufacturing.This unit works for two shifts. There are about 80 workers working in this area who are constantly exposed to this dust.

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Shop floor Air Quality

Sample number : 4
Site : Primary Manufacturing Division (Skip Stacker Section)
Sampling Time : 4 hours
Air flow rate (lpm) : 2.0
Ambient temperature (°C) : 24
Starting time : 2.30 pm
Finish time : 6.30 pm
Weight of the dust (grams) : 0.0028
Dust concentration : 5.8 mg/m3
Remarks : In this area raw tobacco is processed for the cigarette manufacturing.This unit works for two shifts. There are about 80 workers working in this area who are constantly exposed to this dust.

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Shop floor Air Quality

Sample Number : 5

Site : Primary Manufacturing Division (Waste slitting line)

Sampling Time : 4 hours

Air flow rate (lpm) : 2.0

Ambient temperature (°C) : 24

Starting time : 10.00 am

Finish time : 2.00 pm

Weight of the dust (grams) : 0.0015

Dust concentration : 3.1 mg/m^3

Remarks : In this area raw tobacco is processed for the cigarette manufacturing, This unit works for two shifts. There are about 80 workers working in this area who are constantly exposed to this dust

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Shop floor Air Quality

Sample Number	:	6
Site	:	DRF Room (PMD)
Sampling Time	:	4 hours
Air flow rate (lpm)	:	2.0
Ambient temperature (°C)	:	24.0
Starting time	:	10.00 am
Finish time	:	2.00 pm
Weight of the dust (grams)	:	0.0011
Dust concentration	·	2.3 mg/m3
Remarks	:	Where the dust is collected by cyclones. These collected dust is taken for incineration. In this section only one worker gets exposed constantly

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Shop floor Air Quality

Sample Number : 7
Site : Cut Tobacco Storage Yard
Sampling Time : 4 hours
Air flow rate (lpm) : 2.0
Ambient temperature (°C) : 25
Starting time : 2.30 pm
Finish time : 6.30 pm
Weight of the dust (grams) : 0.0011
Dust concentration : 2.3 mg/m3
Remarks : The tobacco which is processed at the primary manufacturing division will be stored in the cut tobacco storage yard. Here about 6 workers are constantly exposed to this concentration of dust for two shifts.

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Shop floor Air Quality

Sample Number	:	8
Site	:	Secondary Manufacturing Division (No: 11 Machine)
Sampling Time	:	4 hours
Air flow rate (lpm)	:	2.0
Ambient temperature (°C)	:	25.5
Starting time	:	9.15 am
Finish time	:	1.15 pm
Weight of the dust (grams)	:	0.0013
Dust concentration	:	2.7 mg/m3
Remarks	:	In this division the tobacco which is received from primary manufacturing division will be used for the manufacturing of cigarettes (final product). In this packing also takes place. This section runs for all the three shifts. Here maximum number of workers are working. This is also high dust prone area.

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Shop floor Air Quality

Sample Number	:	9
Site	:	Secondary manufacturing division (central point)
Sampling Time	:	4 hours
Air flow rate (lpm)	:	2.0
Ambient temperature (°C)	:	25.5
Starting time	:	9.15 am
Finish time	:	1.15 pm
Weight of the dust (grams)	:	0.0007
Dust concentration	:	1.5 mg/m3
Remarks	:	Where the dust is collected by cyclones. These collected dust is taken for incineration. In this section only one worker gets exposed constantly.

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Shop floor Air Quality

Sample Number : 10
Site : Secondary Manufacturing Division (Passage to Shipping Room)
Sampling Time : 4 hours
Air flow rate (lpm) : 2.0
Ambient temperature (°C) : 25.5
Starting time : 9.15 am
Finish time : 1.15 pm
Weight of the dust (grams) : 0.0010
Dust concentration : 2.1 mg/m3
Remarks : In this division the tobacco which is received from primary manufacturing division will be used for the manufacturing of cigarettes (final product). In this packing also takes place. This section runs for all the three shifts. Here maximum number of workers are working. This is also high density dust prone area.

Appendix VI

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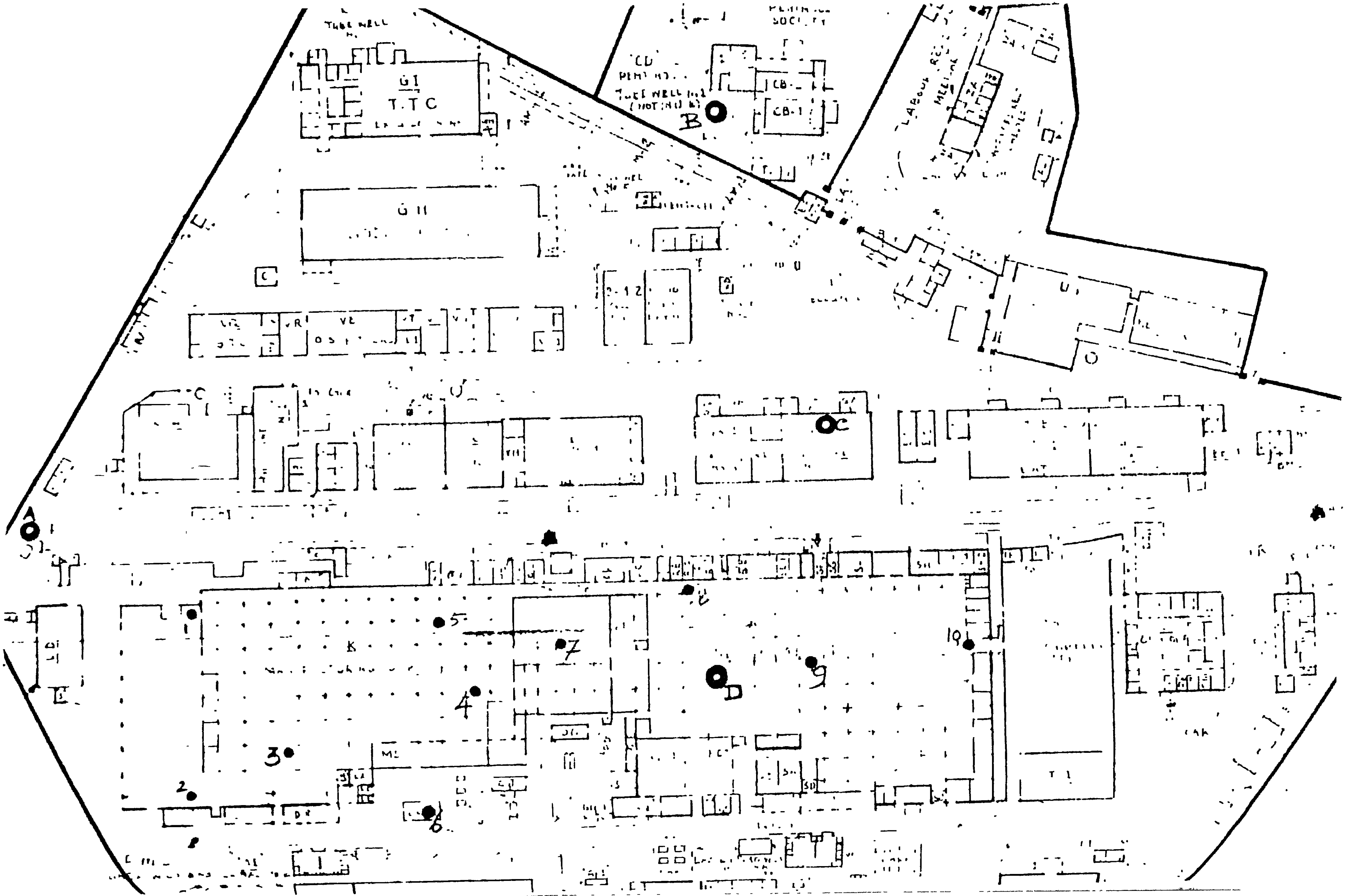
India Habitat Centre, Lodi Road, New Delhi 110 003

Layout map indicating monitoring points

o - Ambient Air Monitoring Stations
• - Shopfloor Air Monitoring Points


SOCIETY
CD
TUBE WELL
(NOT IN USE)
CB
CB-1
LABOUR REST
TUBE WELL
G I
T.T.C
G II
C
U
T 1
K
A
B
C
D
1
2
3
4
5
6
7
8
9
10

Appendix VII

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Drinking Water Results

Bacteriological Analysis

Sample	**Lactase Fermentors**			**Coliform Index MPN/100 ml**
	50 ml	**10 ml**	**1 ml**	
Corporation water	0	0	0	Nil
Treated water for drinking	1	1	2	7

Remarks: Samples were taken to analyse the potability of drinking water. The corporation water was found to be fit for drinking. The open reservoirs in which the water is stored are cleaned and white washed often. Due to the open reservoir, coliform bacteria was found to be present in the water sample. Although not very much above the standards set for drinking water, a little bit of chlorination would ensure safe potability.

Appendix VIII

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Effluent water analysis results

Name of the company : ITC Ltd.
Sampling location : Effluent treatment plan (before treatment)
Date of sampling : 21-7-94
Date of analysis : 22-7-94

Characteristics	**Un treated effluent (mg/ltr)**	**Standards**
pH	6.89	5.5-9.0
BOD in 5 days at 20°C, mg/l	74	500
COD, mg/l	171	-
Suspended solids, mg/l	250	600
Dissolved solids, mg/l	490	2100
Chloride (as Cl), mg/l	280.00	600
Oil & grease, mg/l	6	100
Sulphate, mg/l	Nil	1000
Free Ammonia	0.6	-
Sulphide, mg/l	Nil	-
Ammonical Nitrogen, mg/l	0.8	50
Kjedhal Nitrogen	24.64	-
Cyanide, mg/l	Nil	2.5
Dissolved Phosphate, mg/l	Nil	-
Pesticide, mg/l	Nil	-
Phenolic Compounds, mg/l	0.074	5
Temperature, °C	29	45
Residual Sodium Carbonate	Nil	-
Sodium Absorption ratio	1.867	-
Colour	0.075 (Hazen units)	-
Conductivity (micro mhos/cm)	1085.00	-

Flouride, mg/l	Nil	-
Boron, mg/l	Nil	2
Hexavalent Chromium, mg/l	0.02	2
Lead, mg/l	Nil	1
Zinc, mg/l	0.49	15
Copper, mg/l	0.01	3

Name of the company	: ITC Ltd.
Sampling location	: Effluent treatment plan (after treatment)
Date of sampling	: 21-7-94
Date of analysis	: 22-7-94

Characteristics	**Treated Effluent (mg/ltr)**	**Standards**
pH	5.9	5.5-9.0
BOD in 5 days at 20°C, mg/l	4	500
COD, mg/l	41	-
Suspended solids, mg/l	53	600
Dissolved solids, mg/l	40	2100
Chloride (as Cl), mg/l	280.00	600
Oil & grease, mg/l	5	100
Sulphate, mg/l	Nil	1000
Free Ammonia	0.3	-
Sulphide, mg/l	Nil	-
Ammonical Nitrogen, mg/l	0.5	50
Kjedhal Nitrogen		
Cyanide, mg/l	Nil	2.5
Dissolved Phosphate, mg/l	Nil	-
Pesticide, mg/l	Nil	-
Phenolic Compounds, mg/l	0.037	5
Temperature, °C	30	45
Residual Sodium Carbonate	Nil	-
Sodium Absorption ratio	Nil	-

Colour	0.005(Hazen units)	-
Conductivity (micro mhos/cm)	1085.00	-
Flouride, mg/l	Nil	-
Boron, mg/l	Nil	2
Hexavalent Chromium, mg/l	0.01	2
Lead, mg/l	Nil	1
Zinc, mg/l	0.48	15
Copper, mg/l	0.01	3

Appendix IX

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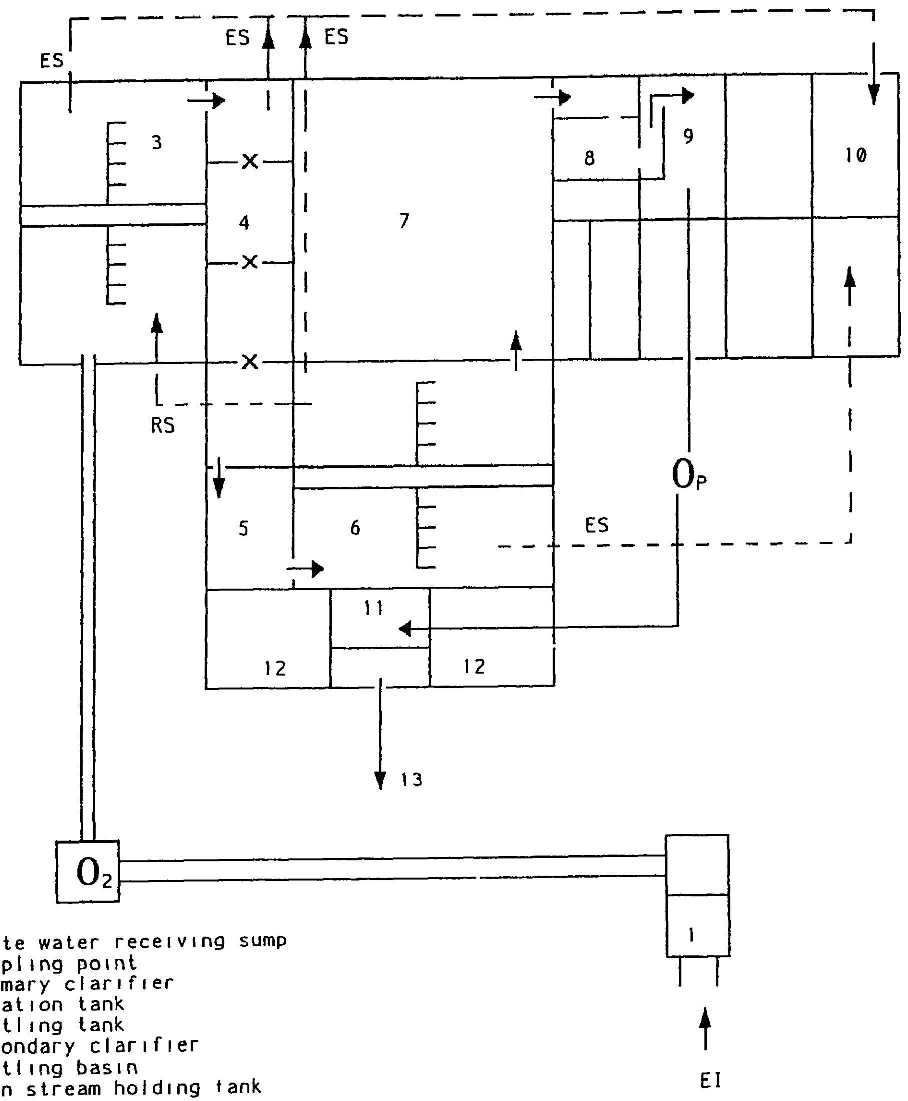
Effluent treatment plant

Appendix XII Effluent Treatment Plant



1	Waste water receiving sump
2	Sampling point
3	Primary clarifier
4	Aeration tank
5	Settling tank
6	Secondary clarifier
7	Settling basin
8	Down stream holding tank
9	Polishing tanks
10	Sludge drying beds
11	Treated water sump (sampling point)
12	Sand pit
13	Treated waste water outlet
P	Pump
RS	Return sludge
ES	Excess sludge
EI	Effluent inlet

Total flow = 100 cubic metre/d
Ferrous Alum = 50 kg/d
Urea = 2 kg/d
DAP = 0 5 kg/d

TERI, NEW DELHI
DATE: 07.12.1993

MINISTRY OF ENVIRONMENT AND FORESTS
NOTIFICATION

New Delhi, the 13th March, 1992.

G.S.R.329 (E)-In exercise of the powers conferred by section 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Environment (Protection) Rules, 1986, namely:-

1. (1) These rules may be called the Environment (Protection) Second Amendment Rules, 1992.
   (2) They shall come into force on the date of their publication in the Official Gazette.

2. In the Environment (Protection) Rules 1986.
   (a) after rule 13, the following rule shall be inserted, namely:

Rule 14 "Submission of environmental audit report" -
Every person carrying on an industry, operation or process requiring consent under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) or under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) or both or authorisation under the Hazardous wastes (Management and Handling) Rules. 1989 issued under the Environment (Protection) Act, 1986 (29 of 1986) shall submit an environmental audit report for the financial year ending the 31st March in Form V to the concerned State Pollution Control Board on or before the 15th day of May every year, beginning 1993. (For the year 1993, the date has been extended to 30th September 1993).

   (b) In Appendix 'A after the Form IV, the following form shall be inserted, namely:

FORM -V
(See Rule 14)

Environmental Audit Report for the financial year ending the 31st March 1993.

PART - A

(i)	Name & address of the owner/ occupier of the industry, operation or process	Indian Tobacco Company Ltd Sardar Patel Marg, P.O.Box 25, SAHARANPUR (UP) Pincode : 247 001
(ii)	Date of last Environmental Audit report submitted	NA

PART - B
Water and Raw Material Consumption

(i) Water Consumption (m_3/d)

Purpose	Water Consumption (m^3/d)
Process	
* Industrial (water & steam)	48
* For Humidification	12
* For washing & cleaning	18
Cooling	NA
Domestic	
* Sanitation	150
* Drinking & washing	250
* Canteen/Hygeine/Horticulture	200
TOTAL	678

Name of Products	Water Consumption per million cigarettes (m^3)	
	During Previous financial year (1992-1993)	During Current * financial year (1993-1994)
Cigarettes	1.95 m^3/year	

* Audited Figures for the 1993-94 will be available after March, 1994.

* Cigarettes manufactured per day = 40 million.

(ii) Raw Material Consumption

Name of raw materials	Name of products	Consumption of raw materials per million cigarettes +	
		During previous financial year (1992-1993)	During current financial year (1993-1994) *
Tobacco	Cigarettes	1.900 MT	
Cigarette paper	"	9.4 Bobbins	
Shell & Slides	"	0.1 million nos.	
Wrapping Paper	"	NA	
Filter Rods	"	160 Nos.	
Aluminium Foils	"	8.75 Bobbins	
Viscose Film	"	NA Bobbins	
CFC	"	90 Boxes	

+ Annual Production of cigarettes for the year 1992-93 is 12,480 million

PART - C
Pollution Generated
(Parameters as specified in the consent issued)

Pollutants	Quantity of pollution generated	Precentage of variation from the prescribed standards with reasons
(a) Water	Water pollution is generated as a result of effluents from the process, industrial and domestic usage. Industrial wastewater is mixed and treated in the effluent treatment plant. The results of the water (treated and untreated) have been given in **Appendix I.**	All the parameters are within limits
(b) Air	Sources of air pollution are the four DG sets [1200 KVA, 1000 KVA, 500 KVA & 250 KVA] and the two oil fired boilers (4 tons / hr, each). Stacks with appropriate heights have been provided for the dispersion of the air pollutants. Stack monitoring results have been given in **Appendix II.**	All the parameters are within the specified standards.
	The ambient air quality results have been given in **Appendix III**	All the parameters are within the specified standards.

PART - D

Hazardous Wastes

(As specified under the Hazardous Wastes/Management & Handling Rules, 1989)

Hazardous Wastes	Total Quantity (kg)	
	During the previous financial year (1992-1993)	During the current financial year (1993-1994)*
(a) From the process	NA	
(b) From the pollution control facilities	NA	

PART - E
Solid Wastes

Solid Wastes (Kgs)	Total Quantity (Kgs)	
	During the previous financial year (1992-1993)	During the current financial year (1993-1994)*
(a) From the process		
* Wet scrap	7,800	
* Rat-tails	1,32,600	
* Sand	2,02,800	
* Knock outs	2,05,000	
* Floor sweepings	62,400	
* Waste line slitting machine-Sand	1,09,200	
TOTAL		
(b) From the pollution control facilities		
* DRF- Dust	54,600	
* ETP- Sludge	NA (all the sludge from the ETP is being used as manure on the plant premisis)	
(c) Quantity recycled or re-utilised	NA (all the organic wastes are used for composting)	

PART - F

Please specify the characteristics (in terms of concentrations and quantum) of Hazardous as well as solid wastes and indicate disposal practice adopted for both these catagories of wastes.

There is no hazardous wastes generated from ITC, Saharanpur. The quantum of solid wastes from the plant process is indicated in
PART- E.

Most of the wet scrap, unusable waste tobacco, floor sweepings and sand (fine tobacco dust, recovered from DRF) are cannot be reused ,are composted along with other organic wastes. The rat-tails which are mixed with sand (recovered from seives) are contracted away for using mostly in the manufacture of snuff. Other solid wastes such as papers, boards, aluminium foils and filter rods are incinerated under central excise department supervision. The CFC's, drums, etc., are sent back to the manufacturers for recycling.

PART - G

Impact of the pollution control measures on conservation of natural resources and consequently on the cost of production.

The ITC factory at Saharanpur has taken care in preserving the natural resources, both air and water, by installing appropriate pollution control measures. The installation costs of the ETP and the dust recovery systems (DRFs and cyclones) have not reflected largely on the cost of production.

All the waste water after treatment is being recycled for horticulture purposes. They have a very well maintained garden and tree plantations on the premises of the factory and staff quarters.